

## CORRESPONDENCE

## COMMENTS ON "A NEW ONE-MINUTE RECORD RAINFALL"

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We have read Mr. Elford's Weather Note, "A New One-Minute Rainfall Record," in the *Monthly Weather Review* of February 1956 with great interest. Our interest is heightened by our experience in operating seventy Universal Recording Gages in Central Illinois. We wish to raise certain questions with regard to the new record.

The first question would be the practicality of attempting to read an accumulative rainfall amount for 0.10 minute from a 24-hour chart which we assume the record chart to be. Our experience with an analysis procedure very similar to Mr. Elford's has been that increments of time smaller than four minutes cannot be read with accuracy, particularly at the higher rates of rainfall since determination of the intersection of two lines which are nearly parallel is subject to considerable ambiguity.

Another point in question is the great possibility that the gage clock was running at a reduced rate or even stopped during the record interval. As Mr. Elford has written in his note, the Chelsea clock movements used in the Universal Recording Gage will run on a single winding for only ten days. It is very likely that the chart drive was slowing down during the time of the record. It is also possible for the clock to have been stopped during the record interval and to have restarted. We note that there is an apparent passage of time during the record accumulation of rainfall, but this is sometimes a false time interval caused by the inaccurate centering of the pen arm from the 4.5-inch line to the pen arm pivot causing the pen point to trace an instantaneous time line which does not describe a chart time arc. In the case under question, the time interval indicated could be explained by the chart having been centered higher than the pen arm pivot.

In summation, we believe that the possibility of an incorrect recording should indicate the necessity of caution in accepting this gage recording as a new record in excessive one-minute rainfall. Mr. Elford's comments will be appreciated.

## REPLY

C. ROBERT ELFORD

Weather Bureau Office, Des Moines, Iowa

June 29, 1956

We appreciate the letter of June 5 from Messrs. Jones and Huff, raising some questions concerning the one-

minute rainfall record established near Jefferson, Iowa, in July 1955.

We are in complete agreement with them that considerable caution should be exercised in the analysis and acceptance of such a record. Discussion and study within the Weather Bureau covered a period of about six months before it was decided that a record would be accepted.

Concerning some of the specific questions raised: We are agreed that 0.10 minute is a short period of time to be read from a 24-hour chart. Obviously, a longer period can be read with somewhat greater accuracy, and the actual period finally used was 1.4 minutes. As indicated in our note, we read the 0.10-minute values and the 0.10-inch values independently to as high a degree of accuracy as was possible. We then plotted the independent readings on the same graph paper to test for consistency, and found them in good agreement. This increased our confidence in the values.

There might well be a question raised concerning the propriety of recognizing any one-minute rainfall since the short period is difficult to evaluate on any existing recording charts. Be that as it may, the one-minute period has been recognized, and this record, as nearly as we can determine, exceeds any previously established. For that reason, we thought it desirable to note the heavy rainfall.

Messrs. Jones and Huff have raised the question concerning the slowing down of the clock movement. We took the question to a jeweler who does some work for us on these clocks. His advice was that any slowing down short of actual stopping, would be slight. He felt that if the escapement mechanism was operating at any speed significantly less than its normal speed, the clock would very quickly stop.

At the time the gage was recalibrated, shortly after the heavy rainfall was observed, the arc struck by the pen followed the curves on the chart without error. From this we assume that the pivot point and the center of the chart were in line. So far as this particular chart is concerned, the pen line started exactly on the 0.50 line, the proper place in our method of operation. In this respect it agreed with the charts that were on previous to and following this chart, and also agreed with the calibration chart. As a matter of fact this chart very nearly fills the drum, and since the clip hooks over the drop of the chart and the drum, it would be impossible for the chart to be off more than a small fraction of an inch.

Each of these items was carefully considered before the record was accepted, and it is believed that a new record one-minute rainfall can be accepted with the same degree of confidence that has been attached to previous one-minute records.